CLAIMS

What is claimed is:

1. A system for detecting proximity motion of a wireless device operating within a wireless network, comprising:

a first network device configured for wirelessly communicating beacon frames which include signal strength information with at least a second network device; and

means for detecting proximity motion in response to signal strength regression analysis when said first network device is moved within the proximity of the second network device.

2. A system as recited in claim 1, wherein said means for detecting proximity motion comprises:

a motion monitoring module configured for continuously monitoring signal parameters within beacon frames;

a regression analysis module configured for performing a regression analysis of signal strengths; and

a motion detection module configured for comparing the output of the regression analysis against one or more thresholds to determine whether proximal motion has occurred.

3. A system for detecting proximity motion of a wireless device operating within a wireless network, comprising:

a first network device configured for communicating wirelessly with at least a second network device;

means for communicating beacon frames containing signal strength information between said first network device and the second network device;

means for performing a signal strength regression analysis on received signal strength information; and

means for generating a proximity motion detection signal in response said signal strength regression analysis performed during close proximity relative motion

between said first network device and the second network device.

4. A system as recited in claim 3, further comprising a media access control module for dispatching beacon frames to wireless devices in the wireless network.

5. A system as recited in claim 4, wherein said beacon frame is an IEEE 802.11 network formatted data frame.

6. A system as recited in claim 3, wherein said means for communicating beacon frames comprises transmitting beacon frames from said first network device acting as a sending wireless device for receipt by the second network device acting as a receiving wireless device, or from the second network device acting as a sending wireless device for receipt by said first network device acting as a receiving wireless device.

7. A system as recited in claim 6:

wherein said means for communicating beacon frames comprises a motion monitoring module operating in combination with a beacon detection module;

wherein said motion monitoring module continuously monitors signal strength parameters in beacon frames.

8. A system as recited in claim 7, wherein said motion monitoring module continuously monitors frame beacons transmitted by the sending wireless device to the receiving wireless device at a predetermined transmission interval.

9. A system as recited in claim 8, wherein said predetermined transmission interval is at or less than approximately 100 milliseconds (mS).

10. A system as recited in claim 7, wherein said beacon frame detection module tunes the interval frequency for transmitting the beacon frames between a

receiving wireless device and a sending wireless device.

11. A system as recited in claim 6, wherein said means for performing a signal strength regression analysis comprises a signal strength regression analysis module configured for regressively analyzing the difference in signal strength between the sending wireless device and the receiving wireless device as the sending wireless device proximately motions towards the receiving wireless device.

12. A system as recited in claim 11, wherein said signal strength regression analysis module is configured for analyzing the difference in signal strength for a recorded set of signal information retained by said receiving wireless device in order to determine whether said sending wireless device is in proximity motion to said receiving wireless device.

13. A system as recited in claim 12, wherein said signal strength regression analysis module is configured for calculating a regression coefficient of the difference in the signal strength of the recorded set of signal strengths.

14. A system as recited in claim 13, wherein the signal strength regression analysis module is configured to calculate a coefficient of determination in the signal strength for the recorded set of signal strengths.

15. A system as recited in claim 14, wherein said proximity motion is detected between said sending wireless device and said receiving wireless device, when the regression coefficient is approximately equal to the quotient of the increase in the signal strength divided by the set of recorded signal strengths and the coefficient of determination.

16. A system as recited in claim 15, wherein proximity motion for said sending wireless device is detected in response to the coefficient of determination exceeding the regression coefficient.

17. A system as recited in claim 15, wherein said increase in the signal strength is pre-calibrated prior to performing said regression analysis on the set of recorded signal strengths.

18. A method of detecting proximity motion between two wireless devices, comprising:

maneuvering a second mobile wireless device in relation to a first, fixed location, wireless device within a given proximity range;

continuously monitoring the strength of signals transmitted between said first target wireless device and said second mobile wireless device as said second wireless device moves towards said first wireless device; and

regressively analyzing said monitored signal strength to determine the proximity motion of said second mobile wireless device with respect to said first target wireless device to determine whether a given proximity range is achieved.

19. A method as recited in claim 18, wherein the given proximity range is less than about 15 centimeters.

20. A method as recited in claim 18, wherein the given proximity range is about 5 centimeters.

21. A method as recited in claim 18, further comprising estimating the relationship between said second mobile wireless device and said first target wireless device without being dependent on the type of said second mobile wireless device to maintain compatibility in a heterogeneous network environment.

22. A method as recited in claim 18, wherein either said first target wireless device or said second mobile wireless device is configured for sending or receiving beacon frames as said first target wireless device and said second mobile wireless device communicatively couple.

23. A method as recited in claim 18, wherein as said second wireless device is maneuvered towards said first target wireless device, the distance between said first target wireless device and said second mobile wireless device is substantially reduced while the strength of the signal between said second mobile wireless device and said first wireless device increase.

24. A method as recited in claim 18, wherein said regressively analyzing the strength of the signal comprises continuously monitoring the strength of the signal of the beacon frames received at a receiving device of either said first target wireless device or said second mobile wireless device to determine if one of the two wireless devices is in proximity motion with the other.

25. A method as recited in claim 24, wherein said regressively analyzing the strength of the signal further comprises calculating the difference between the strength of the signal at a designated time with respect to a time prior to the designated time to determine the strength of the signal as said second mobile wireless device approaches said first target wireless device.

26. A method as recited in claim 25, wherein the regressively analyzing the strength of the signals further comprise linearly analyzing the difference in signal strength for a recorded set of signal strength information with respect to the number sample signals over a period of time during a proximity motion detection.

27. A method as recited in claim 26, further comprising calculating a regression coefficient of the difference in the signal strength of the recorded set of signal strength.

28. A method as recited in claim 27, further comprising calculating a coefficient of determination of the difference in the signal strength for the recorded set of signal strength information.

29. A method as recited in claim 28, further comprising calculating an increase in the signal strength from the start to the end of a proximity motion by said second mobile wireless device.

30. A method as recited in claim 29, wherein proximity motion of said second mobile wireless device is detected in response to the regression coefficient being found approximately equal to the quotient of the increase in the signal strength divided by the set of recorded signal strength information.

31. A method as recited in claim 30, wherein said proximity motion of said second mobile wireless device is detected in response to the coefficient of determination being found greater than the regression coefficient.

32. A method as recited in claim 31, wherein the increase in the signal strength is pre-calibrated prior to performing the regression analysis on the set of recorded signal strength information.

33. A method of detecting proximity motion between a first receiving wireless node and a second sending wireless node, comprising:

continuously monitoring beacon frames transmitted by the second sending wireless node to the first receiving wireless node;

recording the signal strength information contained in the beacon frame transmitted by the second sending wireless node;

retaining the recorded signal strength information in the first receiving wireless node for a designated period of time; and

regressively analyzing the retained signal strength information to determine the proximity motion of the second sending wireless node with respect to the first receiving wireless node.

34. A method as recited in claim 33, wherein the regressively analyzing of the retained signal strength information comprises calculating the difference in the

signal strength with respect to a sampling signal period.

35. A method as recited in claim 34, further comprising linearly analyzing the differences in the signal strength with respect to the number of sampled signals to generate a regressive coefficient of the signals sampled.

36. A method as recited in claim 34, further comprising linearly analyzing the differences in the signal strength with respect to the number of sampled signals to generate a regression coefficient of determination of the signals sampled.

37. A method as recited in claim 36, further comprising calculating the increase in signal strength from the start to the end of a proximity motion of a mobile wireless device with respect to a fixed wireless device.

38. A method as recited in claim 37, wherein proximity motion is detected in response to a regression coefficient of approximately 0.70.

39. A method as recited in claim 37, wherein proximity motion is detected in response to a regression coefficient of approximately 0.75.

40. A method as recited in claim 37, wherein proximity motion of a mobile wireless device with respect to a fixed wireless device is detected in response to a proximity regression coefficient that exceeds a predetermined threshold value.

41. A method as recited in claim 40, further comprising pre-calibrating the increase in signal strength prior to using increases in the signal strength by the regression analysis scheme to determine proximity motion of the mobile wireless device with respect to the fixed wireless device.

42. A method of detecting a mobile wireless device proximity motion with respect to a stationary wireless device in a wireless network, the method comprising:

calculating signal strength fluctuations between the mobile wireless device and the stationary wireless device during proximity motion;

analyzing the signal strength difference between the mobile wireless device and the stationary wireless device as the mobile wireless device approaches the stationary wireless device; and

regressively analyzing the difference in the signal strength with respect to the recorded signal strength information during a signal sampling period to determine whether the mobile wireless device is in proximity motion with respect to stationary wireless device.

43. A method as recited in claim 42, wherein the stationary wireless device and the mobile wireless device are configured in IBSS mode with one of the fixed wireless device and the mobile wireless device being configured as a access point node.

44. A method as recited in claim 42, further comprising calculating the difference in signal strength between the mobile wireless device and the fixed wireless difference with respect to a recorded set of sample signal strength information.

45. A method as recited in claim 44, further comprising performing a linear regression analysis on the difference in signal strengths on the signals transmitted between the mobile wireless device and the fixed wireless device with respect to the number of signals in a given sample to determine a regression coefficient of the signal strengths.

46. A method as recited in claim 45, further comprising performing a linear regression analysis on the difference in signal strengths on the signals transmitted between the mobile wireless device and the fixed wireless device with respect to the number of signals in a given sample to determine a coefficient of determination of the signal strength.

47. A method as recited in claim 46, wherein proximity motion of the mobile wireless device relative to the fixed wireless device is detected in response to the coefficient of determination exceeding the threshold for the coefficient of determination.

48. A method as recited in claim 47, wherein the threshold of the coefficient of determination is approximately 0.70.

49. A method as recited in claim 47, wherein the threshold of the coefficient of determination is approximately 0.75.